Claims

1. Equipment for spectroscopic analysis of autofluorescence of a biological tissue comprising an excitation source (1), a bundle (3) constituted by a single optical fibre or a plurality of flexible optical fibres and means for injecting (2) an excitation signal produced by said source into said bundle according to a useful diameter corresponding to the excitation of the single fibre, all the optical fibres in the bundle or a specific sub-group, and a means for analyzing (21, 22) an emitted autofluorescence signal, characterized in that it comprises at said bundle (3) output an optical head (4) intended to be placed in contact with the biological tissue (6), said optical head being equipped with optical means adapted for converging the excitation signal coming out of said bundle (3) into a subsurface analysis zone (5), the same optical fibre or fibres of said bundle having served for carrying the excitation signal being used for detecting the signal emitted by said subsurface analysis zone, means (D) placed upstream of the means for injecting (2) being moreover provided for separating the excitation signal wavelength and the autofluorescence signal wavelength.

2. Equipment according to claim 1, characterized in that the optical means of the optical head (4) comprise a system of lenses forming a focussing objective adapted for transcribing the spatial distribution of the focal spot (PSF) at the fibre bundle output and the quality of the wave front (WFE) and for minimizing the parasitic reflection occurring at the fibre bundle output.

3. Equipment according to claim 1 or 2, characterized in that the optical head (4) comprises a glass plate intended to come into contact with the biological tissue to be analyzed and adapted for producing an index adaptation with said tissue.

4. Equipment according to any one of the preceding claims, characterized in that it comprises a glass plate placed at the output of the optical fibre bundle (3) and shared with the optical head (4), said plate being sufficiently thick to reject the parasitic parallel reflections at the output of said fibre bundle (3).

5. Equipment according to any one of the preceding claims, characterized in that the means for injecting (2) into the optical fibre bundle (3) has a wave front quality and a spatial distribution of the focal spot intensity adapted to the useful diameter of the fibre bundle (3).

6. Equipment according to any one of the preceding claims, characterized in that the excitation source (1) emits at a wavelength adapted to excite chosen endogenous fluorophores present in the biological tissues of the observed site.

7. Equipment according to any one of the preceding claims, characterized in that the means for separating the wavelengths is a dichroic plate (D).

8. Equipment according to any one of the preceding claims, characterized in that the means for spectroscopic analysis comprise a spectrograph (20) and a means of coupling (21) to the slit of the spectrograph.

9. Equipment according to claim 8, characterized in that the means for coupling (21) to the slit of the spectrograph comprises an achromatic optical means.

10. Equipment according to claim 8 or 9, characterized by a means for rejecting (22) placed upstream of the coupling means (21) and adapted for eliminating the backscattered excitation wavelength.

11. Equipment according to claim 10, characterized by a lens (L2) placed upstream of the means for rejecting (22) adapted for improving the signal-to-noise ratio.

12. Equipment according to any one of the preceding claims, characterized in that it comprises a means for adapting (L1) the size of the beam emitted by the excitation source (1) to the useful diameter of the optical fibre bundle (3).

13. Equipment according to any one of the preceding claims, the fibre bundle (3) comprising a plurality of optical fibres, characterized in that it moreover comprises means for jointly producing a confocal image of the analysis zone (5), comprising:

- an illumination source (30),
- a detector (35) of the return signal for analysis,

- a means for separating (31) the illumination signal and said return signal,
- means for coupling (D2) the excitation beam for the spectroscopic analysis and the illumination beam for the confocal imaging, before introduction into the means for injecting (2) into the optical fibre bundle (3),
- a means (32) for rapid scanning one by one of the fibres situated upstream of the means for injecting into the fibre bundle (3), and
- a system for spatial filtering (33) at the input to the signal detector (35) adapted for selecting the return signal originating from the fibre illuminated,

the means for injecting (2) into the fibre bundle (3) having a spatial distribution of the focal spot intensity equal to the diameter of a fibre core, each fibre being illuminated alternately and in an addressed manner.

14. Equipment according to claim 13, characterized in that the means for coupling are placed upstream of the scanning means (32).

15. Equipment according to claim 13 or 14, characterized in that the illumination source (30) is a pulsed laser diode.

16. Equipment according to one of claims 13 to 15, characterized in that the illumination source has a wave front quality of the order of $\lambda/8$.

17. Equipment according to one of claims 13 to 16, characterized in that the detector (35) of the return signal is an avalanche photodiode.

18. Equipment according to any one of claims 13 to 17, characterized in that the means for coupling (31) the excitation signal for the spectroscopic analysis and the illumination signal for the confocal imaging, comprise a dichroic plate (D2).

19. Equipment according to any one of claims 13 to 18, characterized in that the means (32) for rapid scanning of the fibres one by one comprises a mirror (M1) resonating at a given frequency and a galvanometric mirror (M2) with a variable frequency, and two optical systems each constituted by lenses (L5-8,L9-12) first adapted for conjugating the two

mirrors (M1,M2) then the galvanometric mirror (M2) and the fibre bundle (3) input.

20. Equipment according to any one of claims 13 to 19, characterized in that the spatial filtering system comprises a filtering hole (33) the size of which is such that it corresponds to the diameter of a fibre core, taking into account the magnification of the optical system, between the fibre bundle (3) input and the filtering hole (33).